Internal Use

MT6253(aQFN) SMT & Application Introduction

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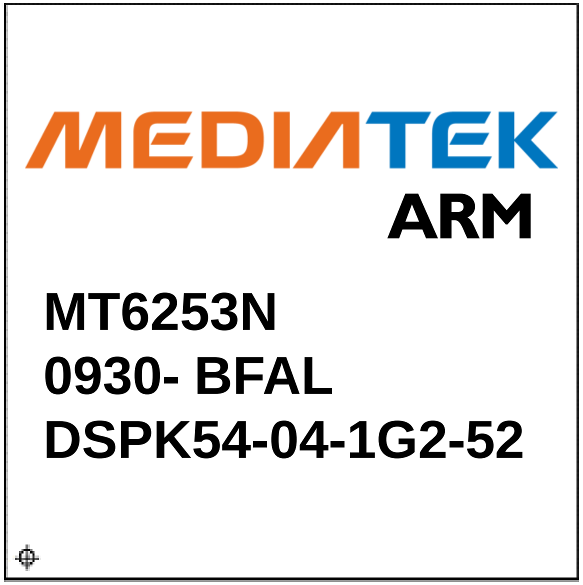
- MT6253介绍
- What is aQFN
- aQFN’s Advantage vs TFBGA & QFN
- 客户量产问题集
- 解决方法：PCB设计
- 解决方法：钢网设计
- MT6253 (aQFN) Task Force Team
- Appendix

MT6253介绍

- Mediatek将于2009年 Q4推出首款GSM/GPRS单芯片方案MT6253
- MT6253集成了数字基频(DBB)，模拟基频(ABB)，电源管理(PM)，射频收发器(RF)。支持手机相机，高速USB，及D类音频功放
- MT6253=MT6225+MT6318+MT6139
- MT6253采用了新一代封装技术(aQFN)

MT6253正印



What is aQFN

- aQFN means Advanced QFN

PKG height (mm)

aQFN	QFN	TFBGA
0.6-0.85	0.85-1	1-1.2

Features

✓ Low Cost, Profile, and Light weight

✓ Excellent Thermal / Electrical Performance

✓ Excellent Anti-drop-&-twist capability

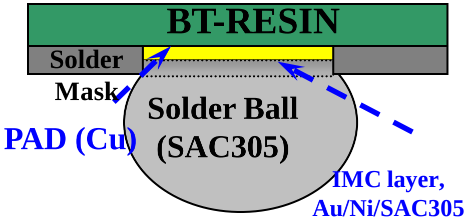
✓ High I/O count up to 400

✓ Leadless & multi-row package

✓ Free-form I/O design

✓ Power / Ground ring

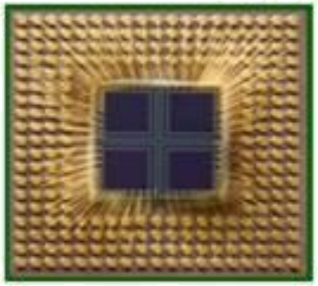
✓ Fine lead pitch 0.4mm



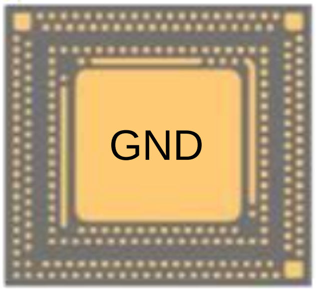
TFBGA

aQFN

Cross-section

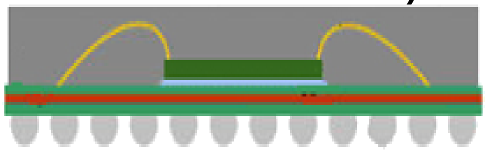
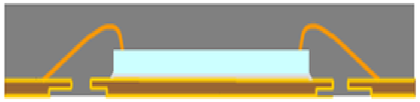


Top view (before molding)



Bottom View

aQFN's Advantages vs TFBGA & QFN

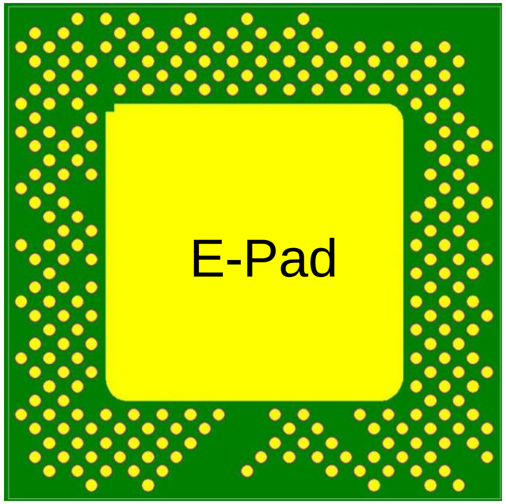
Package Structure	aQFN (MT6253) >	TFBGA (MT6225 + MT6318) 	QFN (MT6139) 
Cost	Medium	**High**	**Low**
Thermal	**Excellent**	Medium	Excellent
Electrical	**Excellent (Lead-frame)**	Medium (Substrate)	Excellent
Anti-drop-&-twist	**Excellent**	Medium	Excellent
PKG profile	**Low**	**High**	Medium
Wire bond-ability	Good	Good	Medium
0.4mm Pitch	Yes	Yes	Yes
SMT ability	Medium (Few experience)	Good (Solder ball)	Good (Single-row)
Rework Method	1.Pre-solder (Fresh) 2.Good SOP & Good Yield	Re-ball (Mature)	Solder Iron (Mature)

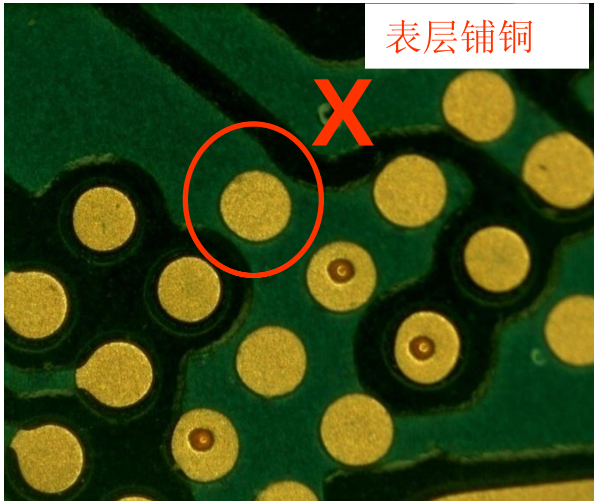
客户量产问题集

客户名称	SMT Yield	5M1E	原因分析	改善措施	改善效果	SMT Debug Time
A	96.0% (1920/2000)	Material	PCB制作问题：Pad偏位	短期：优化钢网消耗库存 长期：改善PCB制作	96%-->99%(9K）	2天
B	93.6% (2808/3000)	Method	钢网问题：开口偏下限	微调钢网开口	93.6%-->99.1%(30K)	2天
C	Prj1：66.7% (8/12) Prj2：75.0% (12/16)	Method	PCB设计问题：RF铺铜	1. 下批PCB表面不铺铜， 2. SA将规则添加到DMS中	<70%-->100%(90Pcs)	5天
D	PCB1 100%(12/12) PCB2 50% (6/12)		PCB制作能力： 无阻焊桥	要求使用PCB1的厂商	50%-->100%(12Pcs)	1天
E	60% (12/20)		PCB制作精度：Pad偏大	SA将PCB规则添加到DMS中	60%-->100%(15pcs)	2天
F	95% (19/20)		多口Flash Tool不稳定	短期：多次反复下载 长期：SA更新DL SW	解决下载不稳定问题	NA(SW Issue)
G	Prj1: 82.5% (66/80) Prj2: 85% (34/40) Prj3: 95.8% (46/48)		1.PCB制作精度：Pad偏小 2.多口Flash Tool不稳定	1. SA将PCB规则添加到DMS中 2. 短期：多次反复下载	<85%-->99.1%(336Pcs)	1天
		Man	纪律问题：厂商未SMT Trail 即生产	1.PM要求厂商必做SMT Trail 2.SA要求客户Follow MTK SOP	解决下载不稳定问题	NA(SW Issue)
H	25% (2/8)				25%-->99.4%(168pcs)	1天

截至3/26，18客户已经MP, 共生产1.02M. 平均良率99.3%

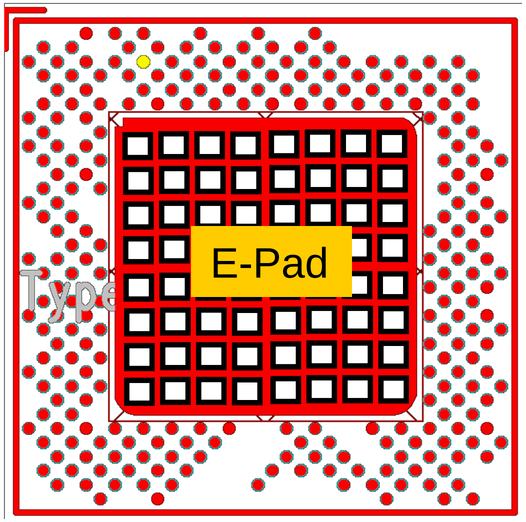
解决方法:PCB设计





- **PCB Layout suggestion for E-pad area:**
  - 推荐与IC接地焊盘相同尺寸 (即封装库1：1的面积比例)制作E-Pad.
- **PCB Layout suggestion for Signal Pad：**
  - 推荐制作直径为0.27mm的圆形焊盘(按封装库1:1制作)，精度控制在+/-0.02mm
  - 禁止在PCB表层使用铺铜设计.
  - 为保证接地性能，RF GND间建议做成网格状走线或将GND Pad连通到内层的GND平面. 表层走线线宽尽量控制在0.2mm以内。
  - Pad与Pad之间留有阻焊桥.

解决方法：钢网设计



MT6253	Thickness	Opening
E-Pad	0.1mm	30%-40% Area
Signal Pad	0.1mm	0.27 ~ 0.28 方形或圆形

- **Stencil Opening suggestion for E-pad area:**
  - 推荐钢网开口面积为PCB E-Pad面积的30%～40%.
  - 推荐钢网开口边缘距离PCB 焊盘边缘0.2mm以上.
  - 建议将钢网开口区域分割成为边长小于2mm的大小相等方块.
- **Stencil Opening suggestion for Signal Pad：**
  - 推荐采用0.1mm厚的钢网.
  - 推荐Signal Pad开口边长（直径）在0.27mm~0.28mm之间.
  - 建议将其外形制作成方形倒角或圆形.

MT6253 (aQFN) Task Force Team:

- PCB Design / Stencil Guide (page A-1&2)
- aQFN Reliability Introduction (page A-3&6)
- aQFN SMT 试产体验计划 (page A-7)

Appendix

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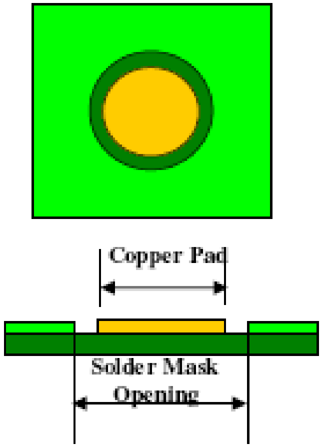
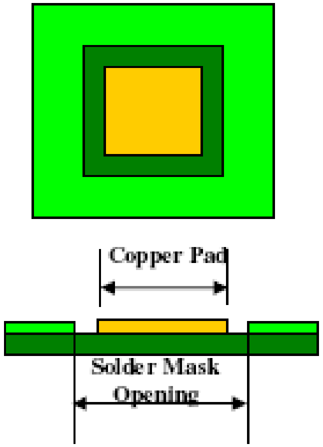
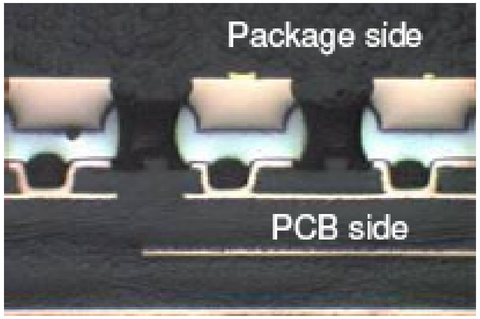
PCB Pad Design Guideline for aQFN







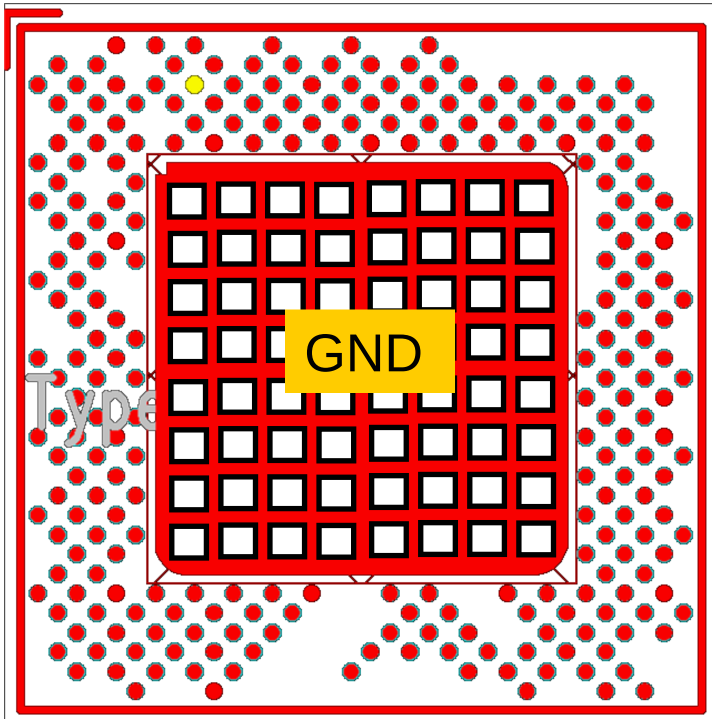
aQFN Package			PCB Pad Design			Stencil	
Land	Terminal	Land	Land	Copper	Solder	Thickness	Opening
0.8mm	0.4mm	Square	Squre	0.43mm	0.53mm	0.12mm	0.48mm
0.8mm	0.4mm	Circle	Circle	0.43mm	0.53mm	0.12mm	0.48mm
0.65mm	0.35mm	Square	Squre	0.375mm	0.475mm	0.12mm	0.4mm
0.65mm	0.35mm	Circle	Circle	0.375mm	0.475mm	0.12mm	0.4mm
0.5mm	0.3mm	Square	Squre	0.325mm	0.425mm	0.1mm	0.38mm
0.5mm	0.3mm	Circle	Circle	0.325mm	0.425mm	0.1mm	0.38mm
0.5mm	0.25mm	Square	Squre	0.275mm	0.375mm	0.1mm	0.33mm
0.5mm	0.25mm	Circle	Circle	0.275mm	0.375mm	0.1mm	0.33mm
0.475mm	0.27mm	Circle	Circle	0.27mm	0.3mm	0.1mm	0.27mm
0.4mm	0.2mm	Square	Squre	0.225mm	0.3mm	0.1mm	0.225mm
0.4mm	0.2mm	Circle	Circle	0.225mm	0.3mm	0.1mm	0.225mm

Stencil Aperture Design rule

MT6253 PKG			PCB Land Pad Design			Stencil	
Land Pitch	Terminal size	Land Shape	Land Shape	Copper Pad	Solder Mask	Thickness	Terminal Opening
0.475	0.27	Circle	Circle	0.27(note1)	0.30(note2)	0.1	0.23 ~ 0.27

GND Opening	Thermal pad	Square Opening	Matrix	Gap
	7X7	0.5(note3)	8X8	0.25~0.33

Unit: mm



Note:

1.Pad尺寸与PCB板厂制作能力决定，此为推荐值，钢网开口尺寸与此値强相关

2.由PCB板厂制作能力决定，此为推荐值

3.请在方框周边倒R=0.075mm的圆角

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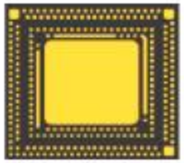
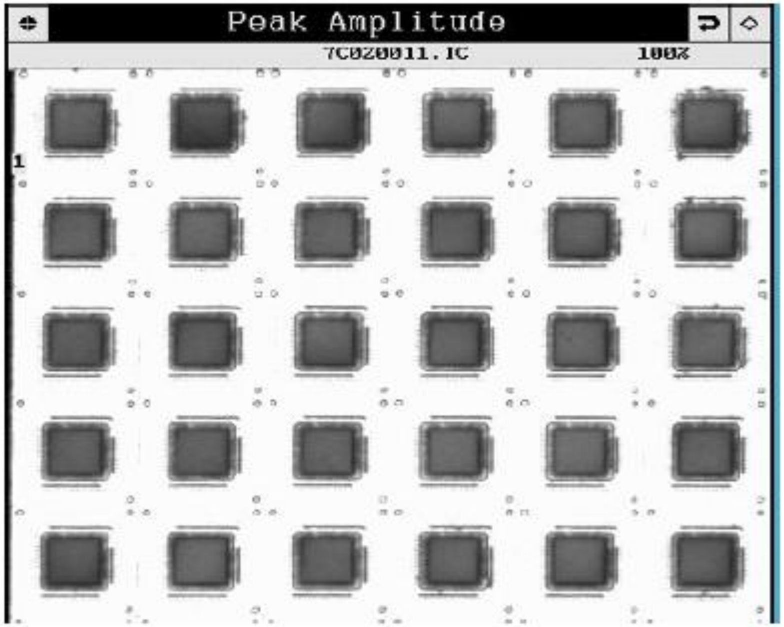
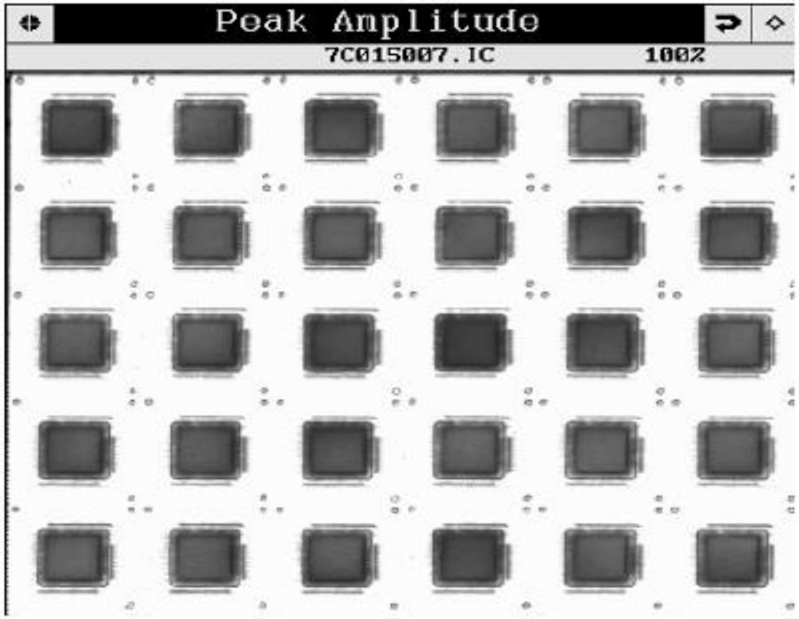
Moisture Sensibility Level Test

- Test Vehicle: 10x10.4 254L & 8x8.5 120L
  - Pre-condition : Passed MSL3 & MSL2Aa.
  - Reliability: Passed TCT1000 , PCT 168 , HAST 96 , HTST1000hrs





MSL2Aa Pass

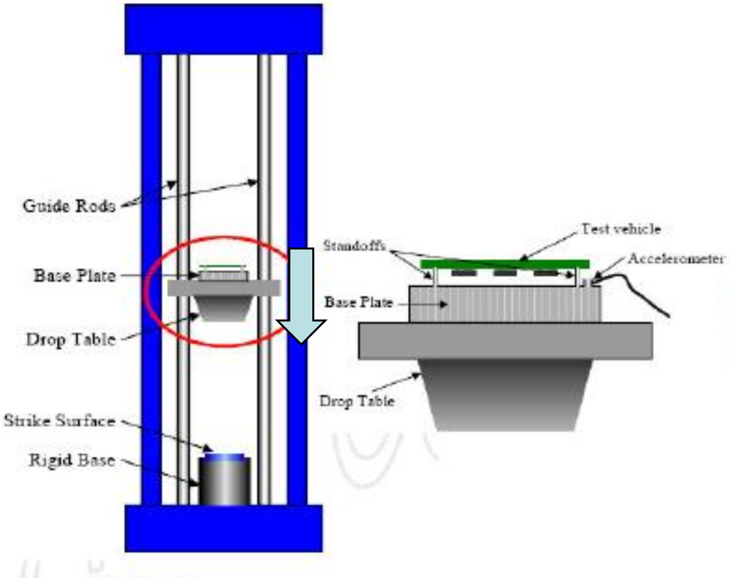


MSL3 Pass

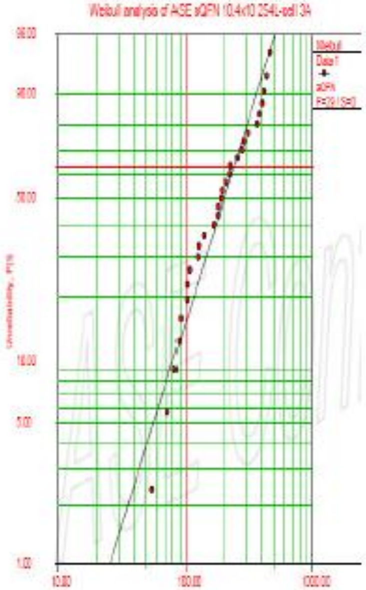
Board Level- Drop Test-1

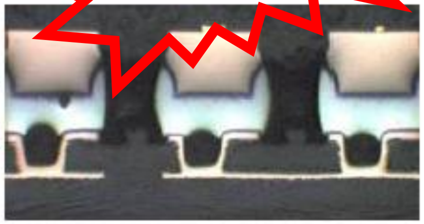
- Passed drop test(30 drops min)
- Failure mode is crack at PCB side.

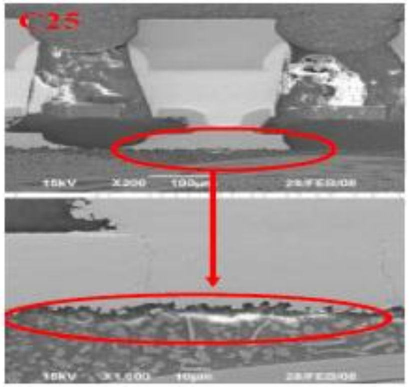
Event Detect Failure of ASE aQFN 10.4x10 254L- cell 3A																		
Cell No.	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	Drop	First fail	63.2% fail
Board-1	89	179	73	102	277	166	381	102	286	223	X	461	127	91	367	461	55	239.1
Board-2	125	435	139	83	189	225	402	55	193	106	255	429	178	207	309	[illegible]		



JEDEC drop test apparatus







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Board Level- Drop Test-2

Drop configuration

Drop apparatus

Package direction: Facing downward

Drop frequency: 300 drops

Test standard: JESD22-B110 Condition B

Peak acceleration: 1500 G (+/- 20%)

Pulse duration: 0.5 ms (+/- 30%)

Velocity change: 467cm/s (+/- 10%)

Monitored system: Event detector

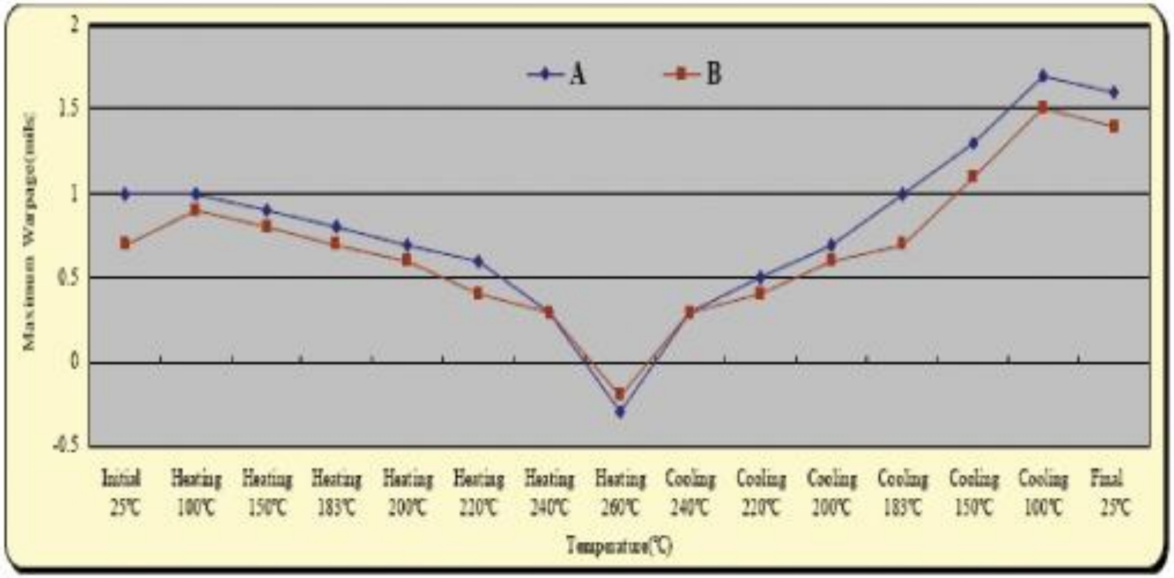
Failure criterion: Exceed 1000 ohm for followed by 3 additional such events during 5 subsequent drops

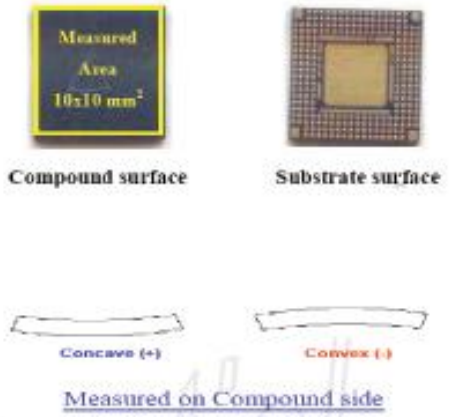
Package Wrapage - Twist

- Shadow Moire (PKG size 10.2x10.2):

Unit: mils

Sample Name	Temperature														
	Initial 25°C	Heating 100°C	Heating 150°C	Heating 183°C	Heating 200°C	Heating 220°C	Heating 240°C	Heating 260°C	Cooling 240°C	Cooling 220°C	Cooling 200°C	Cooling 183°C	Cooling 150°C	Cooling 100°C	Final 25°C
A	+1.0	+1.0	+0.9	+0.8	+0.7	+0.6	+0.3	-0.3	+0.3	+0.5	+0.7	+1.0	+1.3	+1.7	+1.6
B	+0.7	+0.9	+0.8	+0.7	+0.6	+0.4	+0.3	-0.2	+0.3	+0.4	+0.6	+0.7	+1.1	+1.5	+1.4





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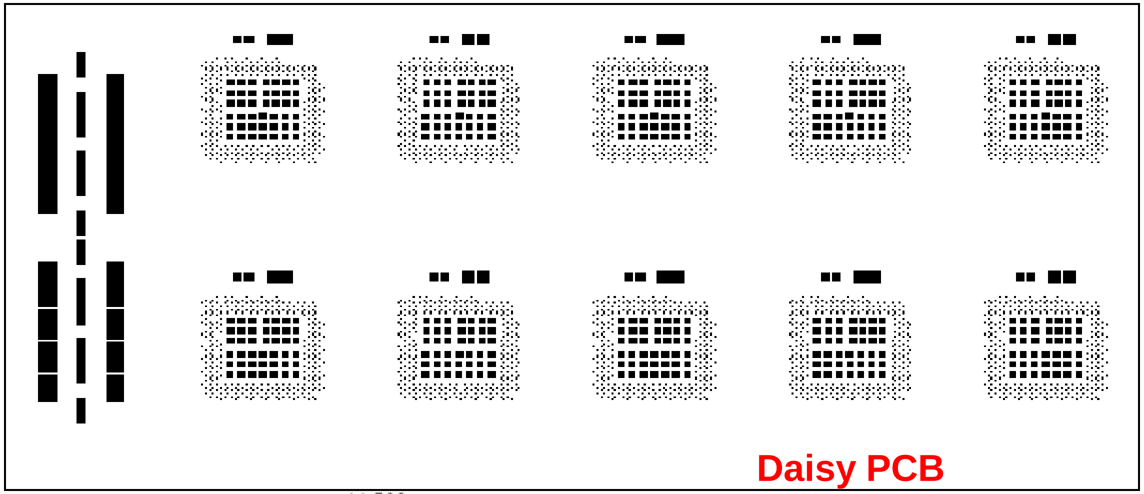
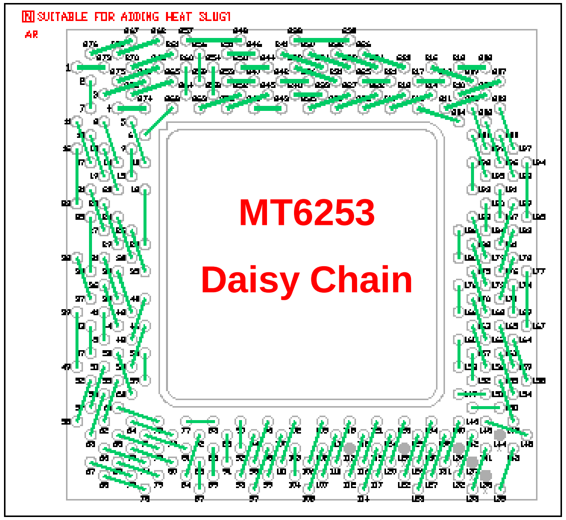
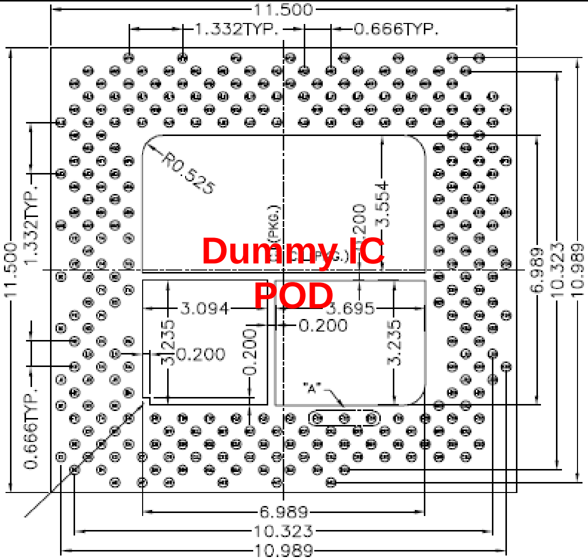
客户体验计划







Proposal & Flow:

1. 客户成立 TFT 小组, MSZ SA 与CS 工程师将协同运作
2. MTK提供 1K Dummy IC 与 100 片 Daisy PCB, 并请客户安排两次 SMT 体验试产.
3. 每次试产前, MSZ 工程师会与 TFT study 与制定相关参数后生产, 如有必要两次试产中间, 会邀请台湾封装厂与相关技术人员至工厂作技术指导与 De-bug. .

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